

REMARKS

Claims 1-2, 7, 13-14, and 16 have been amended. Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version with markings to show changes made." No claims have been cancelled. No claims have been added. Hence, claims 1-19 are pending.

Claims 16 stands rejected under 35 U.S.C. § 112, second paragraph because the limitation "halting the process" lacks proper antecedent basis. Claim 16 has been amended and is now believed to be in full compliance with every paragraph of 35 U.S.C. § 112. Accordingly, the rejection to claim 16 under 35 U.S.C. § 112, second paragraph should be withdrawn.

Claims 1-2, 7, and 14-16 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Matsugu (U.S. Patent No. 6,463,176). Claims 1-16 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Fu (U.S. Patent No. 6,370,271). These rejections are respectfully traversed.

The present invention is directed to an image recognition processing device and method. Referring to Fig. 1, an image recognition device is comprised of a dictionary generating unit 1 which defines a plurality of element data. The element data is supplied to the element matching unit 2, compares the element data with image data. The image data is received from another device and may be, for example, image data from a scanner, photocopier's scanning unit, digital camera, network data, etc. If there is an image match for an element, a match result is transmitted to a pattern detection unit 3, which also receives arrangement data from an arrangement data generating unit 4. The arrangement data is used to detect the relative orientation of a matched pattern to additional matched pattern, in order to determine whether an image is matched.

One problem associated with image recognition is that magnification or reduction alters the relative arrangement between different patterns of an image. For example, Figs. 5(a) and 5(b) illustrate the same pattern, however, in Fig. 5(b) the input

image and target image are at different levels of magnification, and therefore a match calculation would ordinarily conclude that the two patterns do not match, when in fact the two patterns are merely different sized versions of the same pattern. Referring now to Fig. 3(b), it can be seen that the present invention is capable of detecting an image when the image patterns differ in magnification from the target patterns. More specifically, the arrangement data used to detect an image is provided at multiple resolutions. For example, in Fig 3(b), the relative orientation respectively between patterns a and b, a' and b', and a'' and b'', respectively represent the arrangement data at 100%, 95%, and 115% magnification (as used herein, magnification levels below 100% represent reductions).

Accordingly, the independent claims of the present invention have been amended to specifically recite the use of multiple magnification arrangement data. For example, claim 1 recites “an arrangement data generating unit which stores the position data representing the arrangement of the target pattern elements at a plurality of magnifications.” Claim 2 recites “the arrangement of the target pattern elements at a plurality of magnifications.” Claim 7 recites “... at multiple magnifications, of said target pattern elements in order to recognize whether said input image includes said target patter;” Claim 13 recites “... a multiple magnification reference arrangement data of said target pattern elements in order to recognize whether said input image includes said target pattern.” Claim 14 recites “determining arrangement data for said target pattern elements at a plurality of magnifications.”

Matsugu discloses an image recognition system, including element and pattern recognition features. More specifically, Matsugu detects patterns by comparing the orientation of features with a single pattern. Matsugu compensates for different magnifications by scaling input patterns to a plurality of scaling factors σ . Column 6, lines 9-14. Matsugu therefore fails to disclose or suggest the use of the multiple magnification data as recited in each of the amended independent claims.

Fu also discloses an image recognition system, and like Matsugu, discloses the use of comparing input data to a single reference data. (The input data provided to the

system of Fu is rescaled in size and reduced in color resolution, before compared with the single reference data. Column 6, lines 33-42. Fu therefore also fails to disclose or suggest the use of multiple magnification data as recited in each of the amended claims.

Thus, neither Matsugu nor Fu discloses or suggests the use of multiple resolution pattern data for pattern identification. Both Matsugu and Fu taught against the use of multiple resolution pattern data by requiring scaling of input data. Thus, claims 1-2, 7, 13-14 are believed to be allowable over the prior art of record. The remaining claims are also believed to be allowable over the prior art of record for at least these reasons, and because the recited combinations are not taught or suggested by the prior art of record.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

Application No.: 09/479,886

Docket No.: G5030.0013/P013

Dated: June 11, 2003

Respectfully submitted,

By 

Thomas J. D'Amico

Registration No.: 28,371

Christopher S. Chow

Registration No.: 46,493

DICKSTEIN SHAPIRO MORIN &

OSHINSKY LLP

2101 L Street NW

Washington, DC 20037-1526

(202) 785-9700

Attorneys for Applicant

Version With Markings to Show Changes Made

Please rewrite claims 1-2, 7, and 13-14 as follows:

1. An image recognition device, comprising:

an element matching means to match a plurality of input pattern elements obtained by dividing an input image into a plurality of regions with the corresponding target pattern elements of a target pattern; and

a pattern detection means to detect relative positions of said plurality of input pattern elements compared with a multiple magnification reference arrangement data of said target pattern elements in order to recognize whether said input image includes said target pattern.

2. An image recognition device, comprising:

a dictionary generating unit which stores dictionary data for each pattern element in a target pattern;

an element matching unit, which compares and matches input image pattern data which is provided as input against said dictionary data stored in said dictionary generating unit;

an arrangement data generating unit which stores the position data representing the arrangement of the target pattern elements[;] at a plurality of magnifications; and

a pattern detection unit, which based on the output of said element matching unit and said position data from said arrangement data generating unit, determines whether said target pattern can be found in said input image pattern data.

7. An image processing device, comprising:

an element matching means to match a plurality of input pattern elements obtained by dividing an input image into a plurality of regions with the corresponding target pattern elements of a target pattern;

a pattern detection means to detect relative positions of said plurality of input pattern elements compared with a reference arrangement data, at multiple magnifications, of said target pattern elements in order to recognize whether said input image includes said target pattern; and

a control means to control output of said input image to an output device when said pattern detection means recognizes said input image includes said target pattern.

13. A recording medium containing computer code for implementing an image recognition method, said recording medium comprising:

a storage area having stored thereon a computer code, said computer code comprising:

an element matching means to match a plurality of input pattern elements obtained by dividing an input image into a plurality of regions with corresponding target pattern elements of a target pattern; and

a pattern detection means to detect relative positions of said plurality of input pattern elements compared with a multiple magnification reference arrangement data of said target pattern elements in order to recognize whether said input image includes said target pattern.

14. A method of processing an image, said method comprising:

inputting a reference image;

determining target pattern elements for said reference image by dividing said reference image into a plurality of regions;

determining arrangement data for said target pattern elements[;] at a plurality of magnifications;

inputting data for an input image;

determining input elements for said input image by dividing said input image into said plurality of regions corresponding to said reference image; and

comparing said target pattern elements and said input elements.

16. The method of claim 14, further comprising halting [the process] if said target pattern elements include said input elements based on said comparing.